Signal Generator B4

Including B4/A7, B4/B7, B4/A7C and B4/B7C

instruction manual

ADVANCE COMPONENTS LIMITED

Signal Generator B4

(Including B4/A7, B4/B7, B4/A7C and B4/B7C)

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Publication 187

INTRODUCTION

THE Advance Type B4 Signal Generator is available in two versions, the B4/A7 and B4/B7, each providing a wide frequency range with accurate frequency and output voltage calibration.

The frequency ranges are 100kc/s to 80Mc/s on B4/A7, and 30kc/s to 30Mc/s on B4/B7. The accuracy of frequency calibration is $\pm 1\%$. A linear scale and vernier are provided to give very close resetting accuracy. Due to the use of a crystal voltmeter followed by our type A38 high frequency resistive attenuator, the output is measured to $\pm$(1 dB + 2% F.S.D.).

The signal can be modulated internally at 400c/s from 0 to 80%. External modulation, also 0 to 80%, may be applied up to 30kc/s into the B4/A7 and up to 10kc/s into the B4/B7. Both internal and external modulation depths are monitored.

The instruments are of robust construction and are simple to operate.

SECTION TWO

SPECIFICATION

FREQUENCY

Frequency ranges.

B4/A7 100 kc/s to 80 Mc/s in 6 ranges. Accuracy ± 1%

Range A :	100- 300 kc/s.	Range D :	3-10 Mc/s.
Range B :	300-1000 kc/s.	Range E :	10-30 Mc/s.
Range C :	1- 3 Mc/s.	Range F :	30-80 Mc/s.

B4/B7 30 kc/s to 30 Mc/s in 6 ranges. Accuracy ± 1%.

Range A :	30- 100 kcs.	Range D :	1- 3 Mc/s.
Range B :	100- 300 kc/s.	Range E :	3-10 Mc/s.
Range C :	300-1000 kc/s.	Range F :	10-30 Mc/s.

R.F. OUTPUT VOLTAGE

Accuracy ± (1 dB + 2% F.S.D.).

The output voltage from the 75Ω attenuator is fed into a 75Ω transmission line which is terminated with a 75Ω dummy aerial pad. The output into 75Ω is continuously variable from 1μV to 100mV by means of a 4-step decade attenuator and a continuously variable control. The signal is monitored after the variable control to ensure accuracy at high frequencies.

OUTPUT IMPEDANCE

The output impedance at the end of the unterminated transmission line is 75Ω. When terminated by the Termination Pad type TP1D supplied with the instrument, three impedance values are available :—

(1) 37Ω (with full output).

(2) 10Ω (with one-tenth indicated output).

(3) A standard dummy aerial (with one-tenth indicated output).

50Ω models available on request (B4/A7C and B4/B7C).

INTERNAL MODULATION

Frequency 400 c/s ± 10%

Modulation depth 0 to 80%; ± 1 dB ± 2% F.S.D.

EXTERNAL MODULATION

B4/A7 10c/s to 30kc/s, 0 to 80% for frequencies less than 1/30th of the carrier frequency.

B4/B7 10c/s to 10kc/s, 0 to 80% for frequencies less than 1/30th of the carrier frequency.

Approximately 10% modulation depth per volt input into high impedance is obtained. The modulation depth is monitored. Accuracy ± 1 dB.

A.F. OUTPUT

This is obtained from the internal modulation oscillator at approximately 400c/s. Output is approximately 0 to 10V into 600Ω.

R.F. LEAKAGE

Good screening and filtering have reduced stray radiation to less than 1μV.

VALVES

Each instrument is supplied with the following :—

1 ECC 91 Mullard valve (6J6)
1 6SN7GT valve
1 6X5GT valve
1 Pilot lamp, neon type, 100 to 125V

ACCESSORIES

1 Termination and Dummy Aerial Pad, Type TP1D
1 Shielded R.F. Feeder, complete with plugs, type PL5B
1 Shielded A.F. Lead, complete with plug and crocodile clips, type PL18B
1 Supply Lead, type PL39

POWER SUPPLY

B4/A7, B4/A7C, B4/B7 and B4/B7C: 110, 210, 230, 250V 40-100c/s.
Consumption approximately 25W.

WEIGHT

25 lb (11.4 kg) nett.

DIMENSIONS

13 in. x $12\frac{3}{8}$ in. x $7\frac{1}{4}$ in. (33·0 cm x 31·4 cm x 18·4 cm)

SPECIFICATION OF TERMINATION PAD TYPE TP1D

Input impedance 75Ω.

Outputs : 37Ω at full voltage.

10Ω giving one-tenth of input voltage.

A standard dummy aerial giving one-tenth of input voltage.

The TP1D is shown on the circuit diagram

OPERATION

MAINS VOLTAGE

The B4/A7 and B4/B7 are normally despatched with the mains transformer set to operate at 220 to 240V, a.c. (40-100 c/s). For other supply voltages, withdraw the instrument from its case by unfastening the fixing screws round the edge of the front panel, unsolder the lead on the 230-volt tag on the mains transformer, and re-solder it to the appropriate tapping point.

With the correct mains voltage applied, the instrument can be switched on. Warming up takes only a few minutes.

FREQUENCY

Any frequency in the range of the instrument can be selected to an accuracy of $\pm 1\%$ by means of directly calibrated scales and a band selector switch. A linearly calibrated scale with vernier is also provided to enable high accuracy of re-setting to be obtained. If a given frequency is to be required on a number of occasions, the vernier scale reading should be noted, and when re-setting, the instrument should be set to the reading. Fine frequency adjustment is easily obtained using the double slow motion drive which gives a ratio of 25:1. When desired, however, the knob on the main dial may be used to swing from one end of the band to the other.

R.F. OUTPUT

The r.f output into a 75Ω load, or available at the 37Ω socket of the terminating pad type TP1D, is variable between 1μV and 100mV by means of a continuously variable control and a 5 position 20dB per step attenuator. The output voltage is monitored at the input to the attenuator (after the continuously variable control) by a crystal voltmeter with an open scale. This method avoids the frequency errors inherent in the continuously variable control.

To read the output voltage, press the switch marked METER MOD-CW into the CW position. The output voltage available into a 75Ω load or at the 37Ω socket of the TP1D is the product of the reading of the meter, which is calibrated 0 to 15, and the setting of the step attenuator marked X1μV, X10μV, X100μV, X1mV, X10mV.

For accurate reading at the higher frequencies the output line must be correctly terminated, but up to about 5Mc/s the output voltage may be doubled with a slight error by omitting the termination.

When using the 10Ω socket or the dummy aerial socket on the termination pad, the output voltage is one-tenth of the indicated output.

INTERNAL MODULATION

The signal can be internally modulated from 0 to 80% at 400c/s. With the modulation switch set to INT MOD, modulation depth is varied by the SET MOD control. The modulation depth is monitored when the MOD-CW switch is set to MOD. Since the modulation depth is determined by the ratio of modulating voltage to h.t voltage, it is advisable to maintain accurately the mains voltage to the generator.

EXTERNAL MODULATION

The signal can be modulated from an external source up to 80%, the acceptable modulation frequency being 10c/s to 30kc/s into B4/A7 and 10c/s to 10kc/s into B4/B7. The upper modulation frequency is limited to 1/30th of the carrier frequency. It is desirable that the mains input voltage is accurately maintained so that the metering is accurate. The external modulating signal is injected into the A.F. socket with the modulation switch set to EX. MOD. Input impedance is high and a d.c. blocking capacitor is incorporated.

AUDIO FREQUENCY OUTPUT

The signal is available at the A.F. socket from the internal 400c/s modulating oscillator when the modulating switch is at INT. MOD. Approximately 0 to 10V is available into 600Ω, varied by the MOD control. This output is taken from the secondary winding of the modulation transformer and has a low d.c. resistance to earth.

METER ADJUSTMENT

The monitoring circuits are correctly adjusted before leaving the factory. If after long use they become inaccurate, they can be corrected by means of the preset potentiometers provided. These potentiometers are situated just under the mains transformer.

The most accurate method of adjusting the r.f. metering is by the use of a calibrated crystal voltmeter with input impedance of 75 ohms, which will indicate 100mV. With 100mV into the calibrating meter, the instrument meter reading is adjusted to read 10 (X10mV). An alternative is to adjust the metering at a low r.f. frequency, preferably about 1 Mc/s. The output into a valve voltmeter should be 200mV when the instrument reads 100mV.

The modulation depth indication may be adjusted using an oscilloscope. Care should be taken to avoid errors due to the distortion of the oscilloscope amplifiers. It may be preferred to use the cathode ray tubes plates directly, obtaining the deflecting voltage by loose coupling to the tuning capacitor.

The meter face should only be cleaned with an anti-static cloth or other anti-static material.

SECTION FOUR

COMPONENTS LIST

RESISTORS

REF.	DESCRIPTION	PART No.
R1	15KΩ 10% ¼ WATT R.M.A.9	1177
R2	330KΩ 10% ¼ WATT	4408
R3	10KΩ 10% ¼ WATT R.M.A.9	671
R4	15KΩ 10% ¼ WATT R.M.A.8	6381
R5	5.6KΩ 10% ¼ WATT R.M.A.9	1525
R6	10KΩ 10% ¼ WATT R.M.A.9	671
R7	15KΩ 10% ¼ WATT R.M.A.9 B4A ONLY	1177
	22KΩ 10% ¼ WATT R.M.A.9 B4B ONLY	1271
R8	22KΩ 10% ¼ WATT R.M.A.9 B4B ONLY	1271
R9	22KΩ 10% ¼ WATT R.M.A.9 B4A ONLY	1271
R10	1K10Ω % ¼ WATT R.M.A.9 B4A	1175
	3.3KΩ 10% ¼ WATT R.M.A.9 B4B	2736
R11	220Ω 10% ¼ WATT R.M.A.9 B4A	1272
	1KΩ 10% ¼ WATT R.M.A.9 B4B	1175
R12	220Ω 10% ¼ WATT R.M.A.9 B4B	1272
	ON B4A CONNECTION IS STRAIGHT TO COIL	
R13	22Ω 10% ¼ WATT R.M.A.9	4419
R14	1KΩ 10% ¼ WATT R.M.A.9	1175
R15	10KΩ 10% ¼ WATT R.M.A.9	671
R17	330KΩ 10% ¼ WATT R.M.A.9	4408
R18	250KΩ PLESSEY 003/SER Q.C.	11078
R19	1K 5% ¼ WATT R.M.A.9	384
R20	91Ω NON-INDUCTIVELY WOUND POT	3754
R21	1KΩ 10% ¼ WATT R.M.A.9	1175
R22	1.5KΩ 10% ¼ WATT R.M.A.9	4405
R23	240Ω 1% HIGH STABILITY	5797
R24	743Ω 1% ⅛ WATT High Stability	6249
R25	743Ω 1% ⅛ WATT High Stability	6249
R26	743Ω 1% ⅛ WATT High Stability	6249
R27	743Ω 1% ⅛ WATT High Stability	6249
R28	120Ω 1% ⅛ WATT High Stability	5798
R29	91Ω 2% ⅛ WATT High Stability	6250
R30	91Ω 2% ⅛ WATT High Stability	6250
R31	91Ω 2% ⅛ WATT High Stability	6250
R32	82Ω 2% ⅛ WATT High Stability	6251
R33	5KΩ PRE-SET POTENTIOMETER	5884
R34	1MΩ 10% ¼ WATT R.M.A.9	1171
R35	2.2MΩ 10% ¼ WATT R.M.A.9	1180
R36	5.1KΩ 10% ¼ WATT R.M.A.9	7496
R37	680KΩ 10% ¼ WATT R.M.A.9	5024
R38	1MΩ 10% ¼ WATT R.M.A.9	1171
R39	100KΩ 10% ¼ WATT R.M.A.9	1270
R40	5.1KΩ 10% ¼ WATT R.M.A.9	7496
R41	100KΩ 4 WATT POTENTOMETER	7628
R42	1KΩ 10% ¼ WATT R.M.A.8	6911
R43	270 Ω 1% ⅛ WATT High Stability	6896
R44	100 Ω 1% ⅛ WATT High Stability	6106
R45	11 Ω 1% ⅛ WATT High Stability	6414
R46	390 Ω 10% ¼ WATT R.M.A.9	612

CAPACITORS

C1	A-F 3-30pF	Concentric Trimmers	1620
C2	13-514pF	Variable Condenser	7368
C3	100pF	SILVERED MICA	7492
C4	200pF	5% Silvered Mica on B4A	7493
	-750pF	5% Silvered Mica on B4B	7577
C5	-330pF	5% Silvered Mica on B4A	7489
	1200pF	5% Silvered Mica on B4B	7579
C6	-220pF	5% Silvered Mica on B4A	7488
	-800pF	5% Silvered Mica on B4B	7578
C7	0.5μF	250V. D.C.W. Paper Tub	10770
C9	0.5μF	350V. D.C.W. Paper Tub	7491
C10	0.5μF	350V. D.C.W. Paper Tub	7491
C11	0.5μF	350V. D.C.W. Paper Tub	7491
C12	8μF	450V D.C.W. electrolytic	5921
C13	16μF	350V D.C.W. elec. B4A5	7014
	16μF	350V D.C.W. elec. B4B5	7014
C14	16μF	350V D.C.W. elec. B4A5	7014
	16μF	350V D.C.W. elec. B4B5	7014
C15	0.04μF	Min. Metallized Paper	7485
C16	0.04μF	Min. Metallized Paper	7485
C17	0.04μF	Min. Metallized Paper	7485
C18	0.01μF	M/M 10% Hunts L6/4 (MLW) H994	5803
C19	0.04μF	Min. Metallized Paper	7485
C20	0.05μF	Moulded Mica	1524
C21	0.05μF	Moulded Mica	1524
C22	200pF	Moulded Mica	7493
C23	300pF	Min. Metallized Paper	7850
C24	10pF	20% Ceramic Disc B4A ONLY	4274
C25	10pF	20% CERAMIC DISC. B4B ONLY	4274

MISCELLANEOUS

L1	Oscillator Coil. 100-300 kc/s	B4A	RF 541
	Oscillator Coil. 30-100 kc/s	B4B	RF 551
L2	Oscillator Coil. 300-1000 kc/s	B4A	RF 542
	Oscillator Coil. 100-300 kc/s	B4B	RF 541
L3	Oscillator Coil. 1-3 Mc/s	B4A	RF 543
	Oscillator Coil. 300-1000 kc/s	B4B	RF 542
L4	Oscillator Coil. 3-10 Mc/s	B4A	RF 544
	Oscillator Coil. 1-3 Mc/s	B4B	RF 543
L5	Oscillator Coil. 10-30 Mc/s	B4A	RF 545
	Oscillator Coil. 3-10 Mc/s	B4B	RF 544
L6	Oscillator Coil. 30-80 Mc/s	B4A	
	Oscillator Coil. 10-30 Mc/s	B4B	RF 545
L7	R.F. Filter Inductance	B4A	C123
	R.F. Filter Inductance	B4B	C124
L8	R.F. Filter Inductance	B4A	C121
	R.F. Filter Inductance	B4B	C123
L9	L.T. R.F. CHOKE		C95
L10	L.T. R.F. CHOKE		C95
L11	MAINS R.F. CHOKE		C83
L12	DUMMY AERIAL INDUCTANCE		
V1	ECC91 (6J6)		7034
V2	6SN7 GT.		5873
V3	6X5GT		3150
X1	Silicon Crystal Rectifier. B.T.H. Type CS2A		7110
X3-6	Crystal Diode GE. Westinghouse WG5B		11538
S1A/D	R.F. Switch		8332
S2	A.C. MODULATION SWITCH		7382
S3	Meter Switch DP/DT. Bulgin S270 CHR/P		6846
S4	ATTENUATOR SWITCH		A29
S5	MAINS SWITCH		6718
N1	Pilot Lamp, neon type, 100 to 125V.		1165
T1	MODULATION TRANSFORMER		MT310
T2	MAINS TRANSFORMER INPUT 110-210-230-250 V. 40-100 c/s on B4/A7, B4/A7C, B4/B7, B4/B7C		MT309
M1	100μA METER		5880

The voltages shown on the circuit diagram were measured on an "Avometer' model 8 (20,000 ohms per volt d.c.) The 3 Mc/s r.f. measurement wastaken on the advance "Advac" a.c. millivoltmeter.
All the measurements were taken withgenerator set to 3 Mc/s with modulation switched on and set to a depth of 50%.

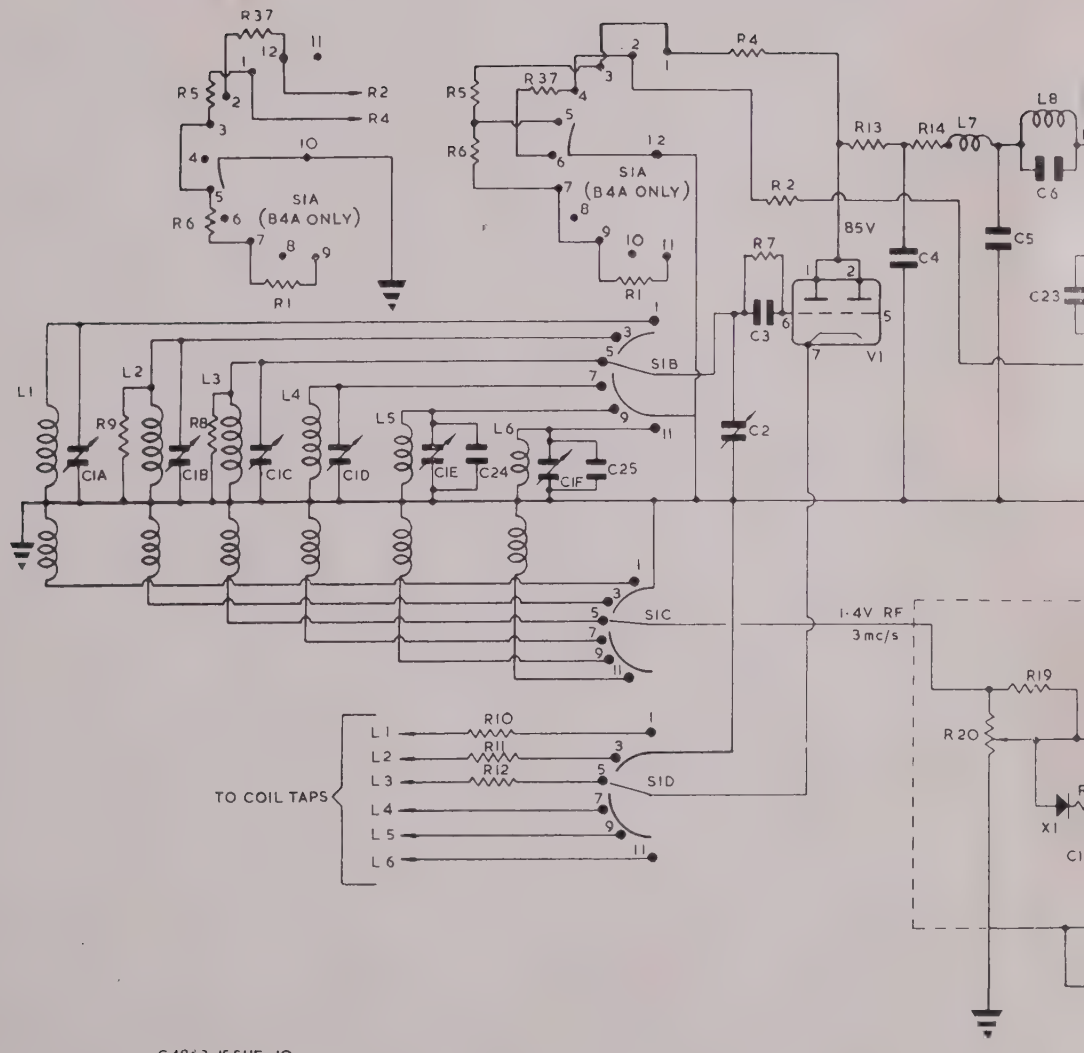

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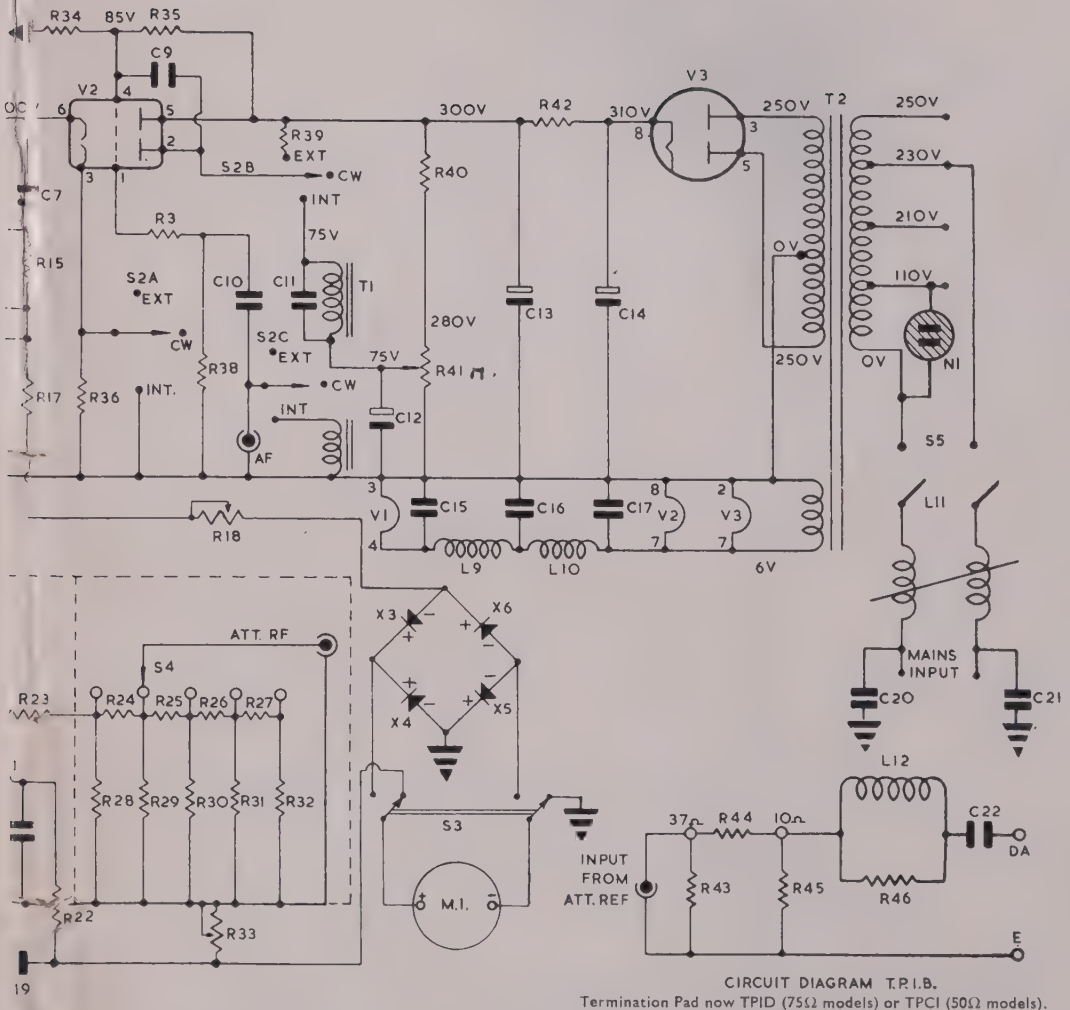
Fig. 1. B4 Circu



CIRCUIT DIAGRAM T.P.I.B.

Termination Pad now TPID (75Ω models) or TPCI (50Ω models).

THE RIGHT IS RESERVED TO ADJUST VALUES OR AMEND THIS CIRCUIT WITHOUT NOTICE

it Diagram

FACTORY SERVICE

Our factory Service Department is at your disposal should you wish to obtain further repair information by telephone or letter. The Type and Serial Number of the instrument should always be quoted. We maintain an efficient Service facility and the instrument can, if desired, be returned to our factory for repair.

The instrument is guaranteed for a period of one year from its delivery to the purchaser for the replacement of defective parts, other than valves, semiconductors and fuses.

Valves and semiconductors are subject to the manufacturer's guarantee.

Equipment returned to us for servicing must be adequately packed, preferably in the special box supplied, and shipped with transportation charges prepaid. We can accept no responsibility for instruments arriving damaged. Should the cause of failure during the guarantee period be due to misuse or abuse of the instrument, or if the guarantee has expired, the repair will be charged and put in hand without delay unless other instructions are received.

OUR SALES, SERVICE AND ENGINEERING DEPARTMENTS
ARE AT YOUR SERVICE AT ALL TIMES

SECTION SIX

AMENDMENTS FOR 50Ω MODELS

SIGNAL GENERATOR—TYPE B4/A7C & B4/B7C

Amendments to Handbook

Page 4 Reference to 75 ohms impedance should read 50 ohms.

Page 4 Reference to 37 ohms impedance should read 25 ohms.

Page 5 Termination Pad type TP1D is replaced by TP1C.

Page 5 RF lead PL5B is replaced by PL43.

Page 5 AF lead PL18B is replaced by PL18A

Circuit Diagram

R23 is 162 ohms PN.362
R24 is 490 ohms PN.365
R25 is 490 ohms PN.365
R26 is 490 ohms PN.365
R27 is 490 ohms PN.365
R28 is 82.5 ohms PN.6251
R29 is 62 ohms PN.363
R30 is 62 ohms PN.363
R31 is 62 ohms PN.363
R32 is 56 ohms PN.364
R43 is 91 ohms PN.372

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